2.0. FIELD MEASUREMENT

Although environmental measurement has traditionally been done in the laboratory, data collection can often be optimized by including field measurement. Field measurement may include qualitative tests or quantitative tests.

2.1. FIELD TESTS

Field testing of concentrated industrial wastes has several advantages:

1) Site Safety Plans can be refined with better knowledge of the hazards of the wastes on site.

2) Sampling strategies can be more effective if some qualitative information on the waste is available. For example, if drums or other containers can be grouped into lots of the same material, then a stratified sampling strategy can be used. This approach is discussed further in Section 3, Sampling.

3) Incompatible wastes can be identified for future waste handling purposes.

4) Laboratory analytical requests can be more targeted and therefore more effective. More targeted analytical requests have led to shorter turnaround times and lower costs.

2.1.1. Safety Considerations.

In general, personal protection during field testing should be the same as that used for hazardous waste sampling. The use of a field laboratory with an adequate hood (with a face velocity of 60-100 linear feet per minute) can eliminate the need for most respiratory protection. However, gloves and goggles or face shield should always be worn when conducting tests. It is recommended that persons performing field sampling or testing should receive training on hazardous materials incident response operations.

2.1.2. Field Characterization Procedures.

Field characterization procedures range from a few screening tests, such as those listed below, to the elaborate HAZCAT (Hazard Categorization) scheme which was developed by Robert Turkington, formerly of CAL-OSHA. The sampling techniques for field testing are generally the same as for laboratory samples. For liquids, glass thieves are generally adequate for sample collection. Additional information on sampling is available in Section 3.3. Industrial Waste Sampling.

Explosivity Meter Test:

Follow the instrument manufacturer's directions for calibration and use. For waste in drums or other containers, insert the probe into a bung hole or other opening. A reading >100% of the Lower Explosive Limit (LEL) indicates that the contents are ignitable.

Organic Vapor Tests:

Portable direct-reading instruments such as an Organic Vapor Analyzer (OVA), or an HNU® with a photoionization detector (PID) and/or flame ionization detector (FID) can provide useful information on headspace or vapor samples. The instruments must be calibrated according to the manufacturer's directions. Positive results indicate that the waste contains volatile organic components. Record the readings and the calibration substance.

Physical Characteristics:

Note the physical state (liquid, solid, semisolid, or mixture). Note the color, viscosity (resistance to flow), and appearance (e.g., crystalline or amorphous). Note if any reaction with air is occurring, such as fuming, color change, or polymerization.

Radioactivity:

Use a radiation survey meter to check for an increase over background radioactivity.

Water Reactivity/Solubility:

Caution: This test should be performed in a hood with the sash as far down as possible or with adequate personal protection. Position test sample downwind from operator. Place about 1 gram (1 ml of a liquid) in a disposable glass or plastic container which contains 10 ml of distilled water and observe any reactions. Gas generation, color change, large temperature increase, ignition, or rapid polymerization are all signs of water reactivity. If a liquid sample mixes with the water to form a single phase liquid, it is considered to be miscible with water. If the liquid is not miscible with water, note whether it is denser (sinks) or lighter (floats). If a solid dissolves in water, it is considered to be water soluble. After it is determined that no reaction has occurred, measure the temperature with a thermometer or thermocouple (ref: ASTM D 5058-90 Test Method C).

Compatibility:

Caution: This test should be performed in a hood with the sash as far down as possible or with adequate personal protection. Position test sample downwind from operator. Combine samples of the two wastes in the ratio to be mixed, and observe any physical

changes. To determine potential exothermic reactions, measure the temperature before and after mixing. (Ref: ASTM D 5058-90 Test Method A).

pH:

For an aqueous (water-based) liquid, pH test strips can be immersed directly into a 5-10 ml sample in a disposable container. For non-aqueous liquids and solids, the sample must first be mixed with water or the pH test strip must be wetted first. Compare the color of the pH test strip with the color chart supplied with the strips. Due to the uncertainty of this test, a sample with a pH less than 3 should be considered acidic, and a pH greater than 10 should be considered alkaline (Ref: EPA Method 9041A).

Oxidizer Test:

Dip a strip of acidified potassium iodide (KI) paper into the sample or the sample mixed with water. A purple to black color is positive for a strong oxidizer.

Sulfide Test:

Dip a strip of acidified lead acetate test paper into the sample or the sample mixed with water. A brown or black color is positive for sulfides. Alternately, sulfides can be detected by acidifying a small sample with sulfuric acid and testing the headspace with a hydrogen sulfide detector tube, such as a Draeger® tube.

Cyanide Test:

Cyanides can be detected either by using a cyanide test paper (e.g., Cyantesmo test paper (Macherey-Nagel)) above an acidified sample, or by using a hydrogen cyanide detector tube (e.g., Draeger tube) above an acidified sample.

PCBs in Oil

The CLOR-N-OIL™ kit can be used to screen for halogenated organics in oil. It is a semiquantitative test; that is, it gives an estimate of the concentration of PCBs present. The test kit is available from the following:

Address:	Dexsil Corporation, One Hamden Park Drive, Hamden, CT 06517
Phone:	800 433-9745
FAX:	203 248-6523
Internet address:	http://www.dexsil.com

Sample Number: _____ Ambient Temperature: _____

Type of Container:_____

Markings on Container:_____

_____

Air Reactive: Pos._____Neg._____Radioactive: Pos._____Neg._____

Beilstein's Halogen Test: Pos._____Neg._____Liquid:_____

Solid:_____Other (Specify):_____

Appearance of Waste:_____

OVA or HNU Reading:_____(attach chromatogram if applicable)

_____

Waste/water mixture (determine the water reactivity, record liquids as soluble or insoluble in water, estimate the percent solubility of solids):

_____

_____

pH determination:_____

Oxidizer Test: Pos._____Neg._____ Peroxide Test:Pos._____Neg._____
Sulfide Test: Pos._____Neg._____ Cyanide Test: Pos._____Neg._____

Comments:_____

_____

_____

_____

Hazardous waste characterization data sheet.
Figure 2.1-1

Halogens in Oil

EPA and California have standards for total halogens (organic and inorganic halogens) in oil. The CLOR-D-TECT™ kit can be used to screen oil samples for halogens. The kit is available from:

Address:	Dexsil Corporation, One Hamden Park Drive, Hamden, CT 06517
Phone:	800 433-9745
FAX:	203 248-6523
Internet address:	http://www.dexsil.com

The Beilstein test can also be used to estimate organic halogens.

Lead Test Kits

Several lead test kits are available for the testing of surfaces, soil, and ceramic ware. One test kit is the "Lead Check" swab, available from:

Address:	HybriVet Systems, Inc., Framington, MA 01701
Phone:	1-800-262-LEAD
Internet Address:	http://www.leadcheck.com

When evaluated using soil spiked with lead-based paint, the Lead Check test kit results correlated well with the hazardous waste classification using the California Waste Extraction Test.

2.1.3. Reliability of Field Tests.

Field tests are normally designed to err on the positive side; that is, to produce a higher rate of false positives than false negatives. However, an excessively high false positive rate can lead to high analytical costs for laboratory verification and overly expensive waste handling plans. New field tests should be evaluated against the established laboratory methods prior to field use.

2.1.4. Scope of Field Tests.

Field tests are generally more successful on relatively pure substances, because appearance may give some clues and because the field tests give more definitive results on pure substances. Conversely, complex waste mixtures may not yield useful information from field tests.

2.1.5. Commercially Available Test Kits.

A number of field test kits are available for water and wastewater, such as from Hach Kits:

Address:	Hach Chemical Company, P.O Box 389, Loveland, CO 80539-0389
Phone:	303 669-3050
Internet Address:	http://www.hach.com

Color indicator tubes (e.g., Draeger® tubes) are available for a variety of airborne contaminants. Follow the manufacturer's instructions and note potential interferences when interpreting the result. Newer test kits based on immunoassays, are available for some pesticides and industrial chemicals. Consult the manufacturer's information for the kit's applicability and limitations.

2.2 REFERENCES

1) "Standard Test Methods for Compatibility of Screening Analysis of Waste," ASTM D 5058 - 90, in Annual Book of ASTM Standards, American Society for Testing and Materials, July, 1990.

2) "Field Analytical Measurement Technologies, Applications, and Selection", California Military Environmental Coordination Committee (CMECC), April 1996.